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Wygant

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(54) **FOAM PROJECTILE**

(75) Inventor: **Steven J. Wygant**, Syracuse, IN (US)

(73) Assignee: **Blackpoint Engineering, LLC**, Goshen, IN (US)

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(51) **Int. Cl.**
F41A 27/00 (2006.01)

(52) **U.S. Cl.** **42/75.03**; 124/56; 124/63; 446/429; 446/430; 446/473; 446/267

(58) **Field of Classification Search** 124/56, 124/63; 446/429, 430, 473, 267
See application file for complete search history.

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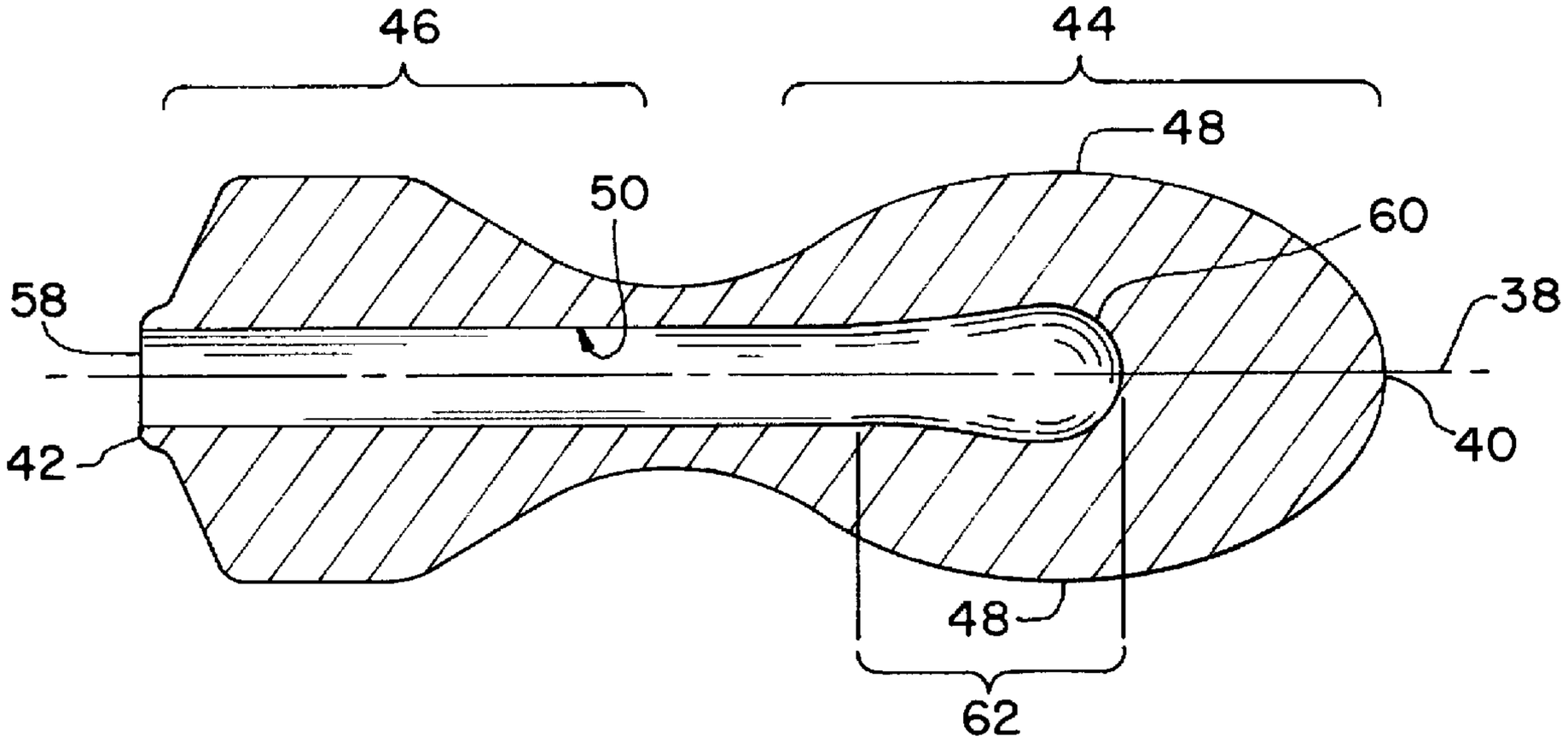
Primary Examiner—Troy Chambers
Assistant Examiner—Samir Abdosh
(74) *Attorney, Agent, or Firm*—Taylor IP, P.C.

(57) **ABSTRACT**

A combat game weapon system includes a pneumatic launcher and an elastic projectile. The pneumatic launcher includes a barrel. The barrel includes a distal end and a bore with an inside diameter. The elastic projectile is configured for being expelled from the distal end of the barrel. The elastic projectile includes a cavity configured for expanding when the cavity receives a propellant from the pneumatic launcher and thereby for causing the elastic projectile to sealingly engage the inside diameter.

18 Claims, 6 Drawing Sheets



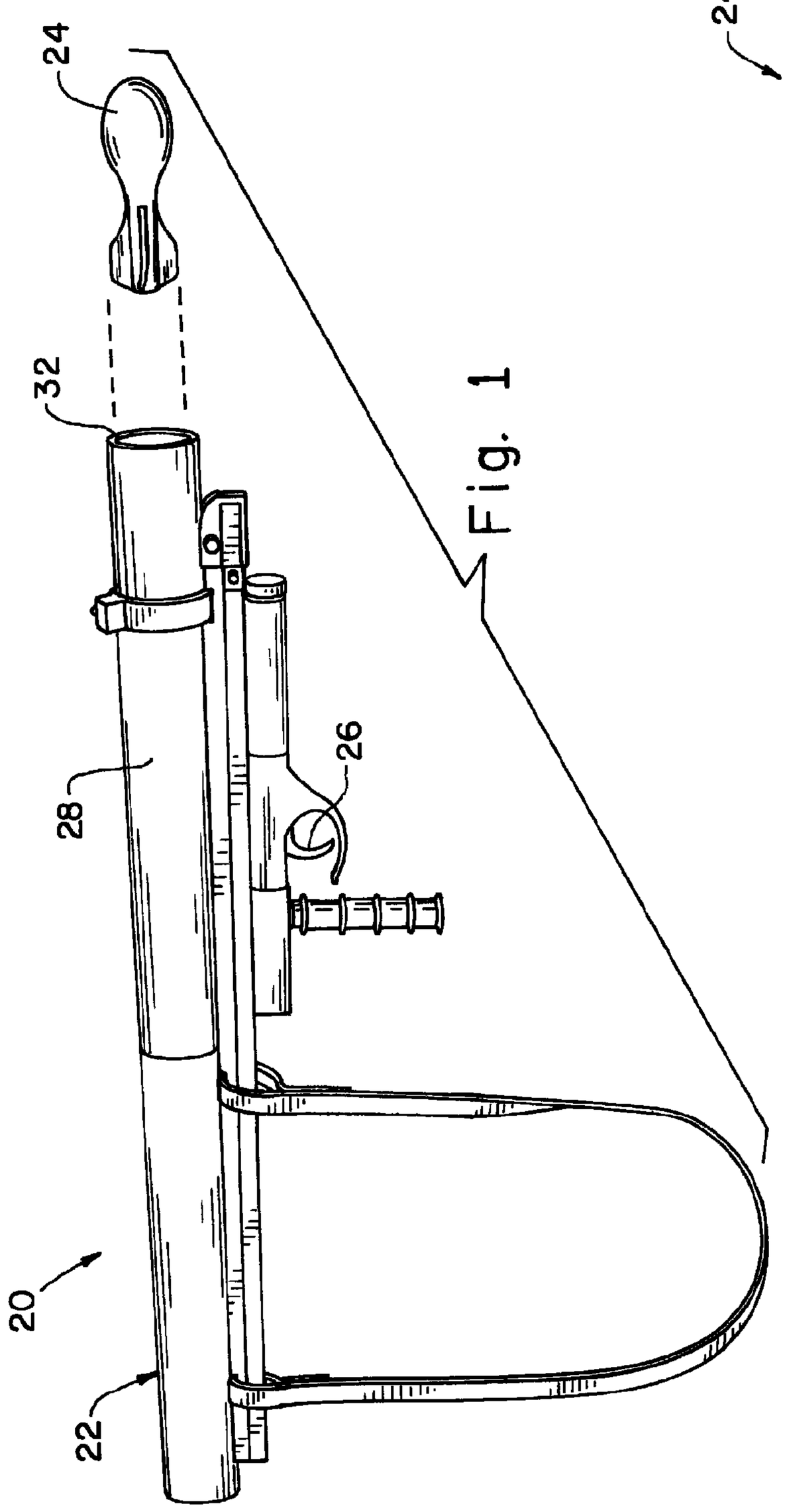


Fig. 1

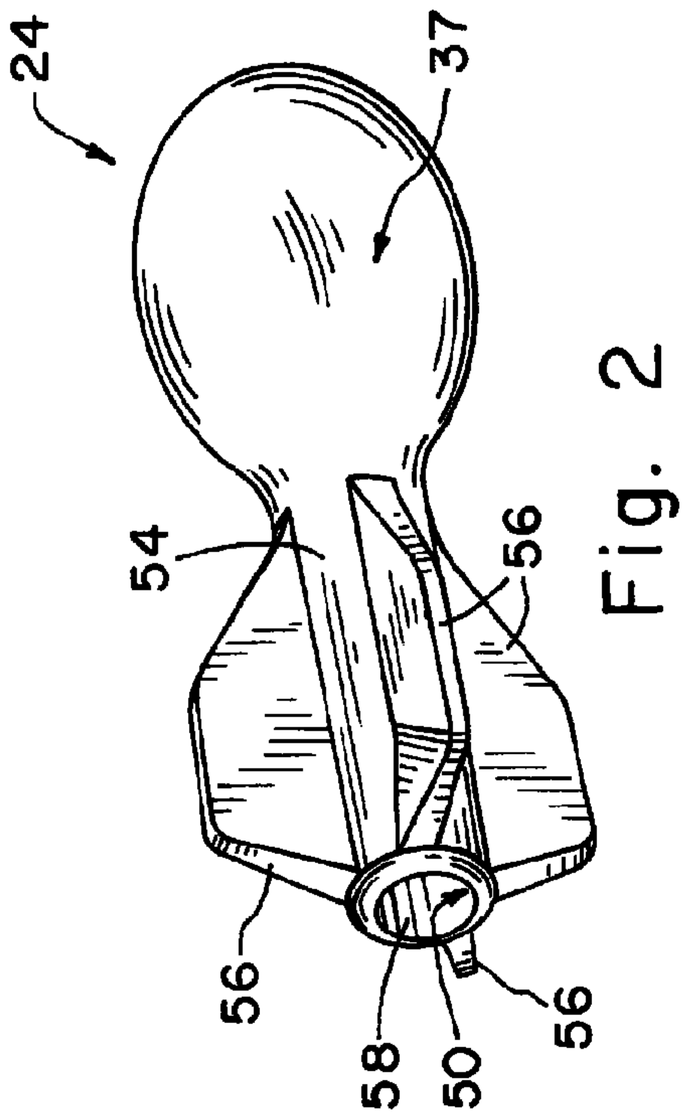


Fig. 2

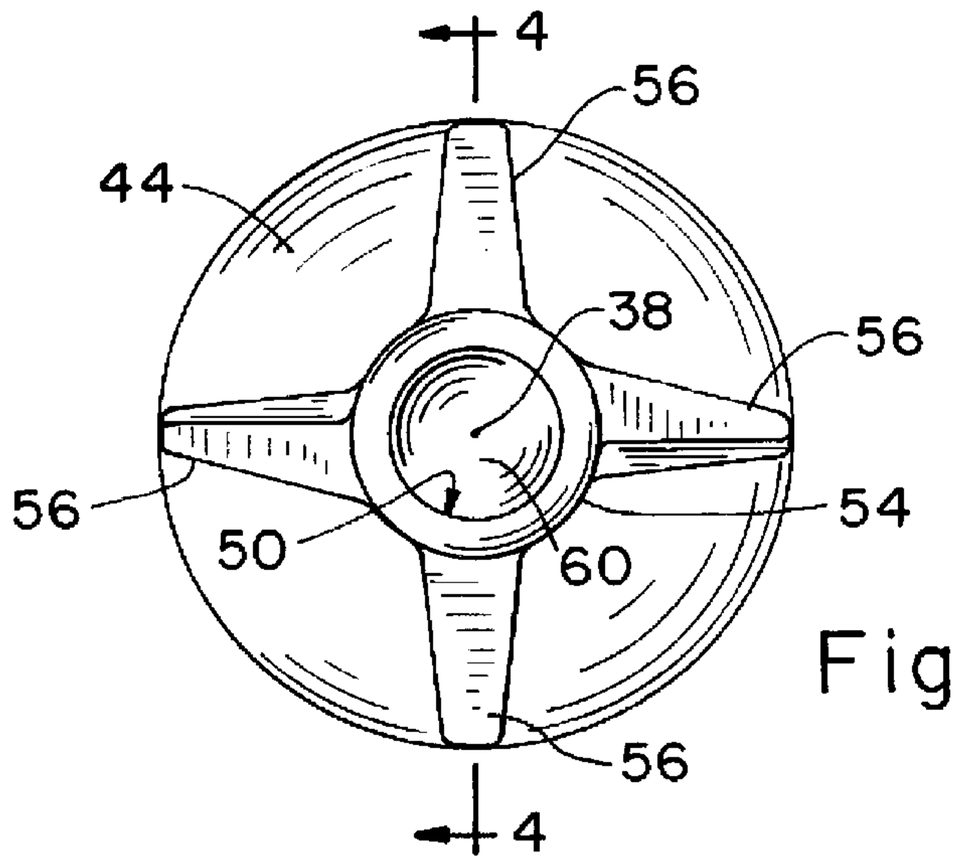


Fig. 3

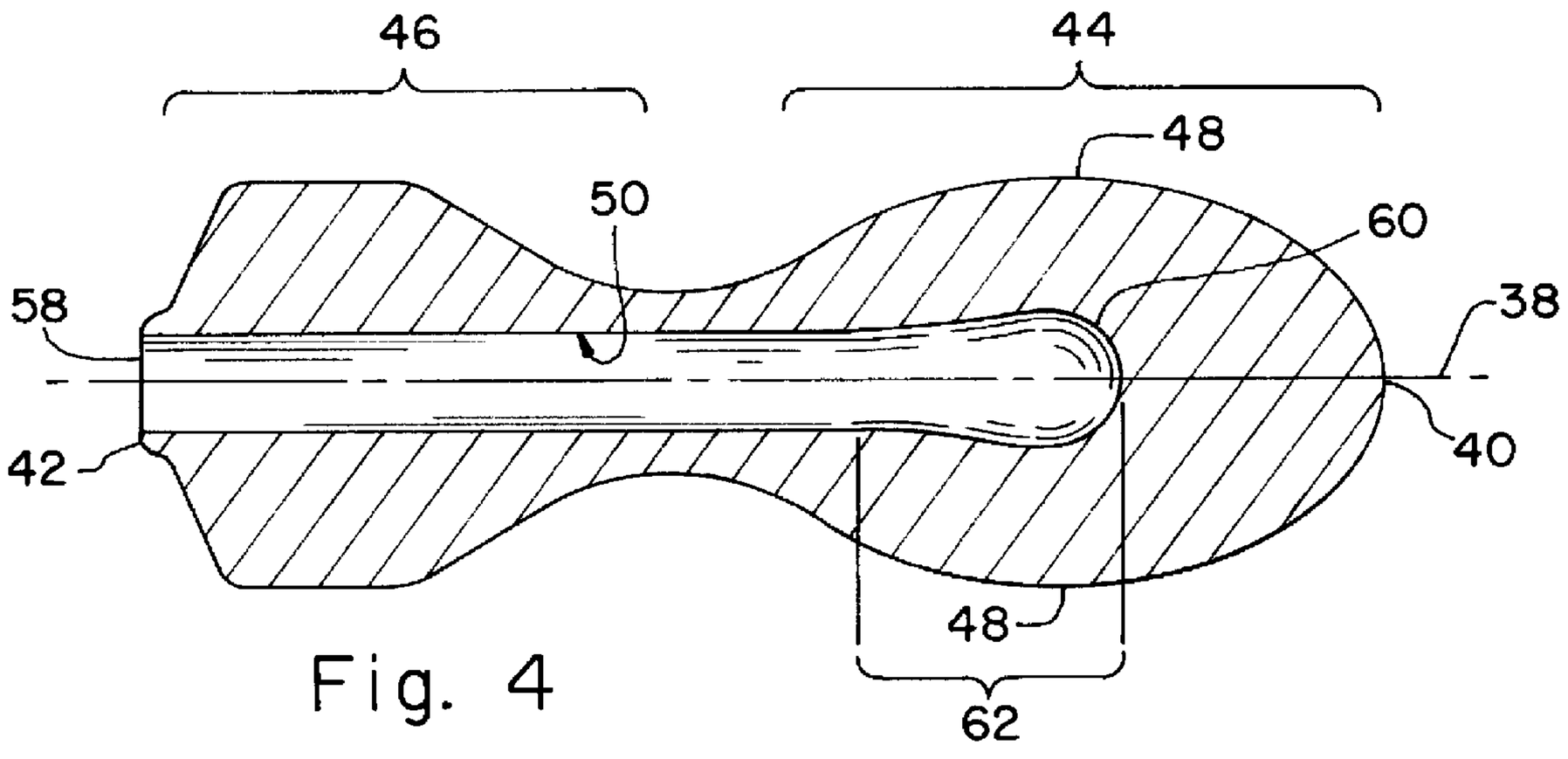


Fig. 4

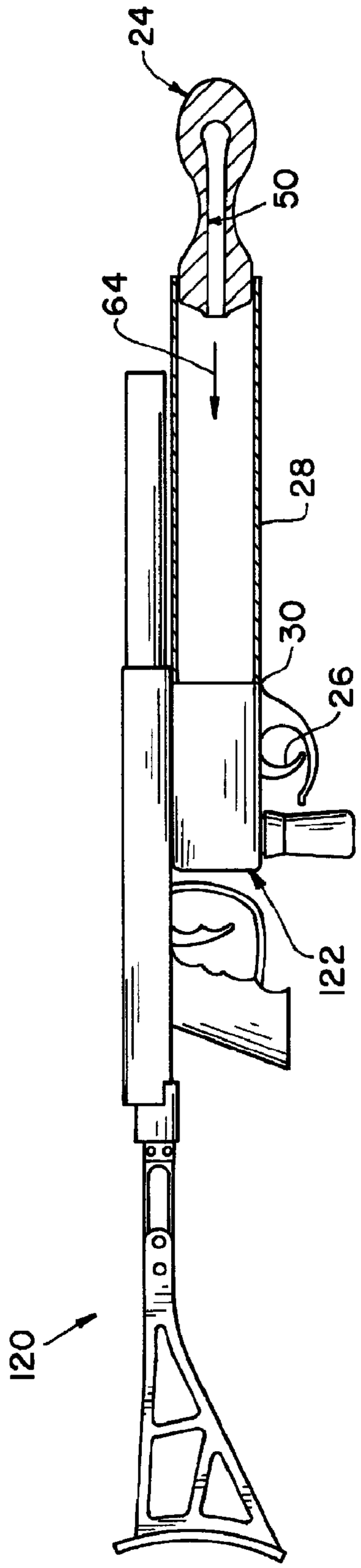


Fig. 5

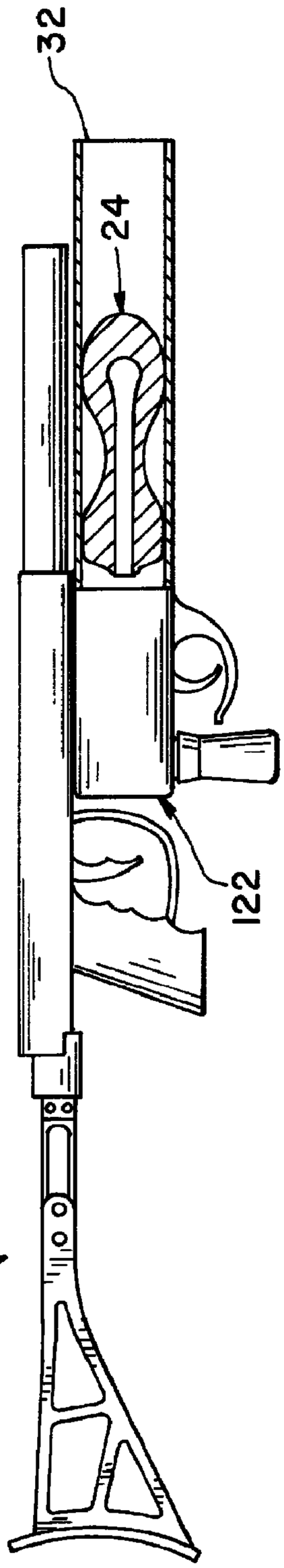


Fig. 6

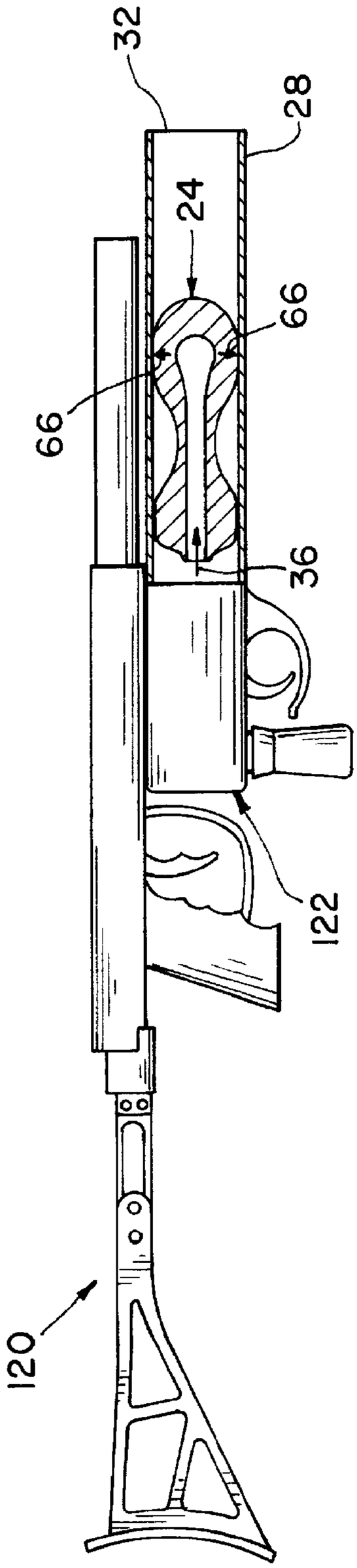


Fig. 7

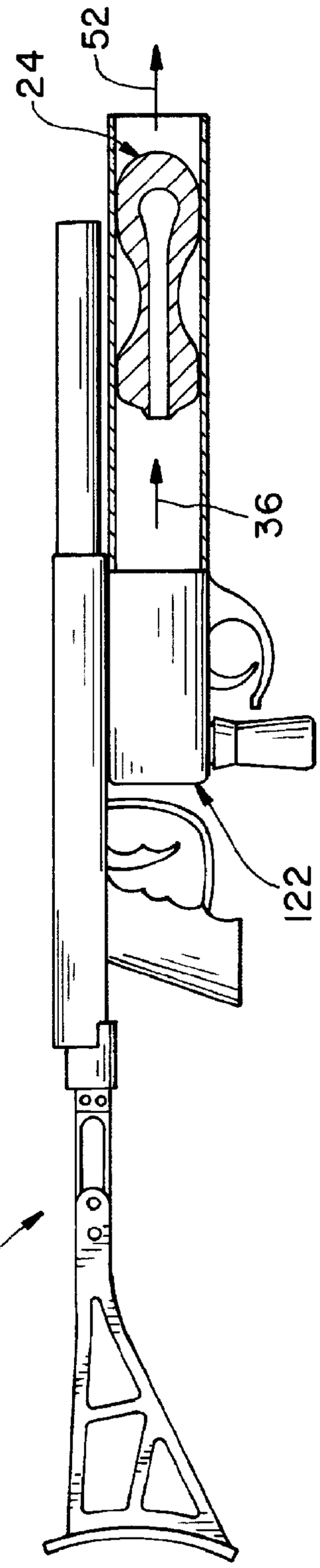


Fig. 8

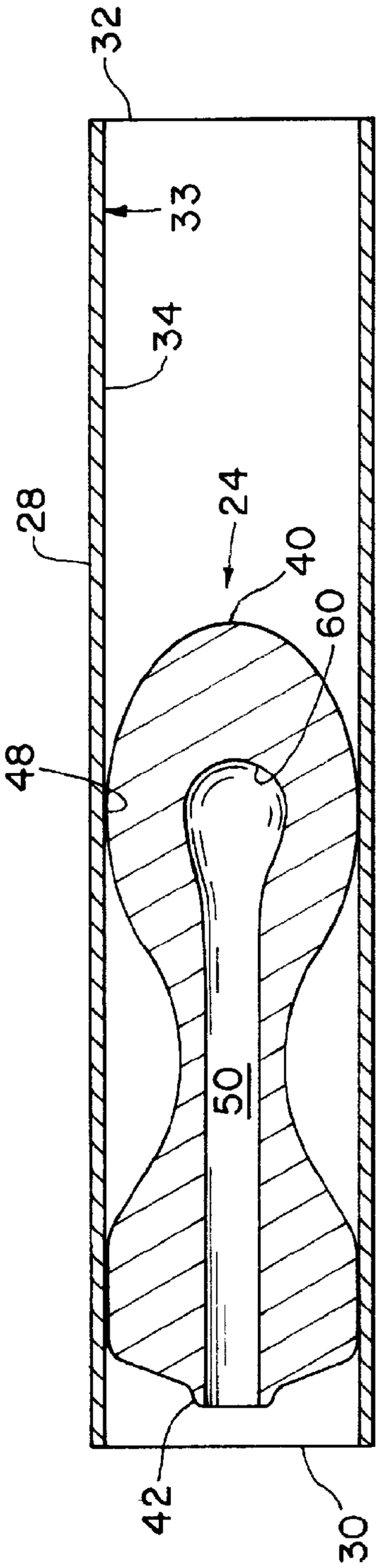


Fig. 9

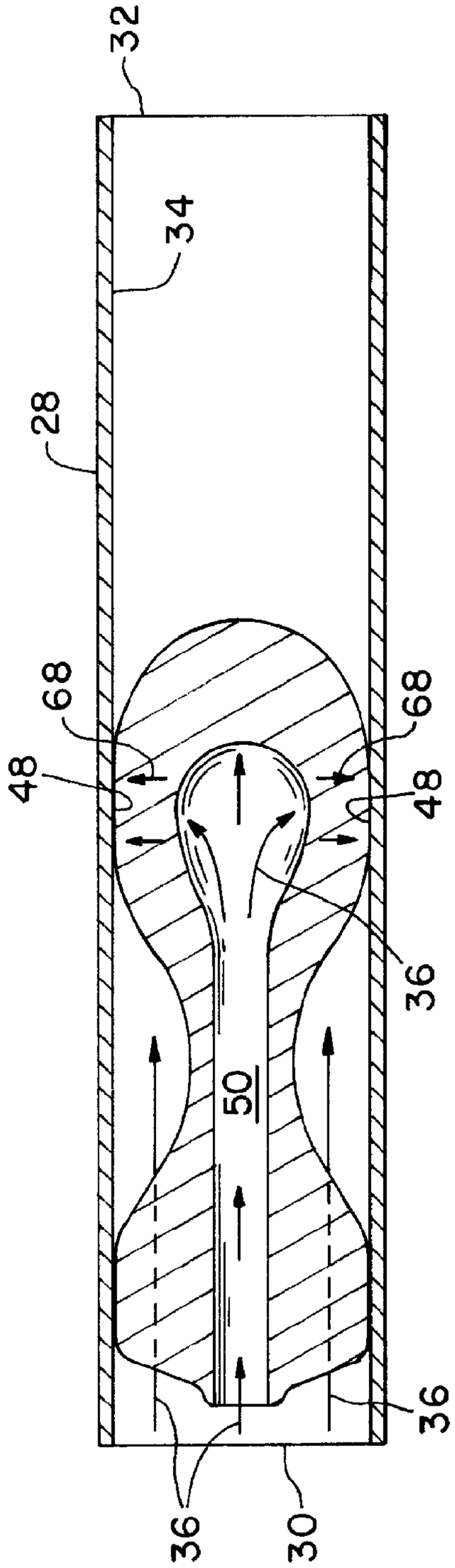


Fig. 10

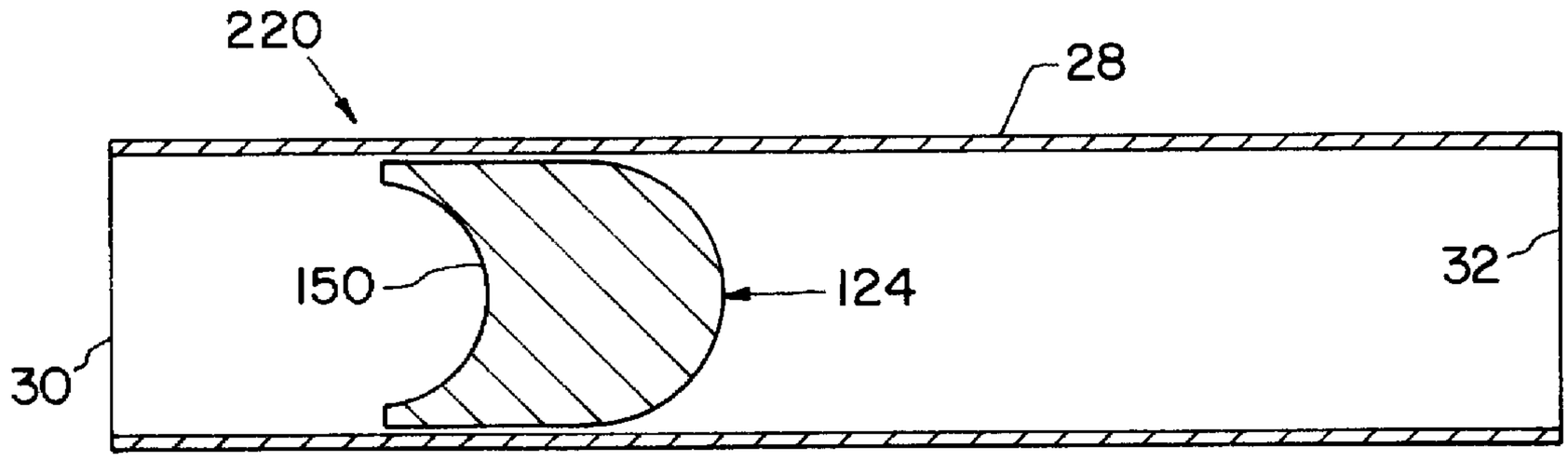


Fig. 11

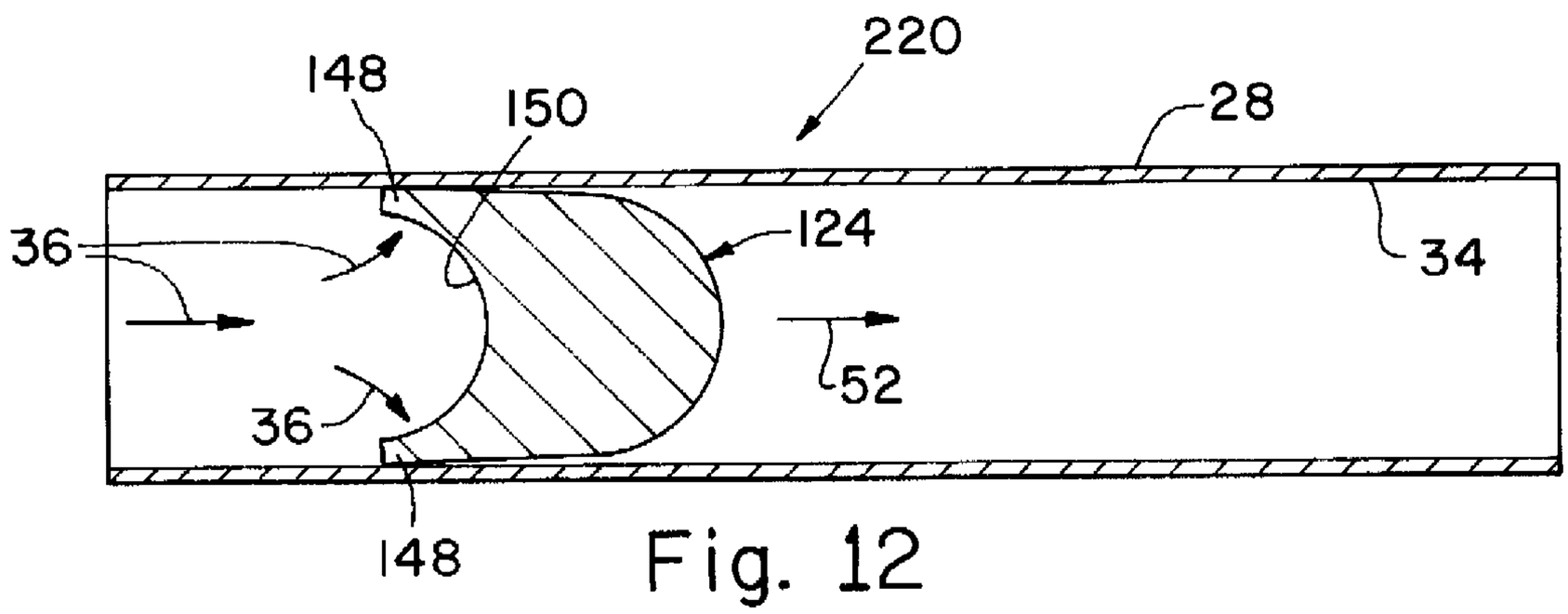


Fig. 12

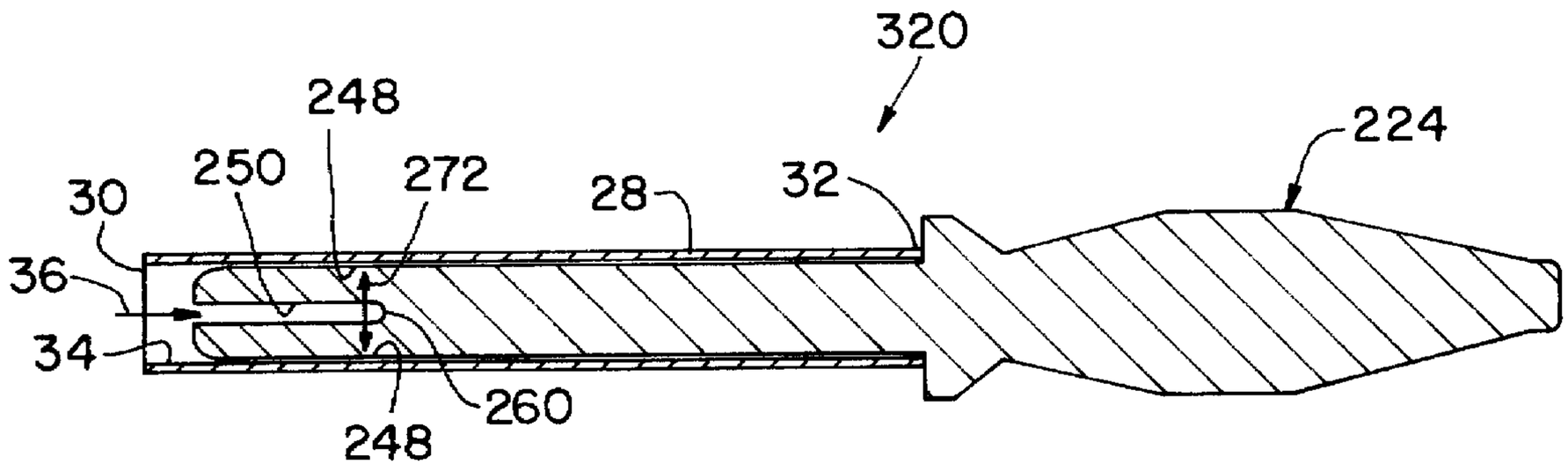


Fig. 13

FOAM PROJECTILE

CROSS REFERENCE TO RELATED APPLICATIONS

This is a non-provisional application based upon U.S. provisional patent application Ser. No. 60/948,049, entitled "FOAM PROJECTILE", filed Jul. 5, 2007, which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to combat game weapon systems, and, more particularly, to projectiles of combat game weapon systems.

2. Description of the Related Art

Simulated weapon systems typically include a pneumatic shooting device and a projectile. The system can be used as a non-lethal deterrent in law enforcement, as a simulated weapon in war games, and as systems in what is commonly referred to as "paintball". In addition to the paintball gun, simulated launchers, hand grenades, exploding land mines, rockets, and other combat game weapons have been employed in mock war games.

A foam projectile is known which does not have a hollow core but does have a rigid pin core that is used to stiffen the tail section of the projectile. The pin usually has a molded head that keeps it in position and to reduce the effect of impact. A problem with this construct is that it allows high pressure gas to blow by and between the inner diameter of the barrel of a launcher and the outer perimeter of the projectile.

Another foam projectile is known which uses a stiffening tube that fills the periphery of a cavity in the projectile. The stiffening tube is also capped with an end cap at the leading end of the cavity. A problem with this construct is that the stiffening tube and the end cap are rigid and do not allow the gas flow in the cavity to expand the diameter of the foam projectile.

What is needed in the art is a projectile with a cavity which expands radially upon receiving compressed gas, thereby causing the outer surface of at least a portion of the projectile to engage in a sealing manner the inner diameter of the barrel of the launcher so as to increase the flight distance of the projectile.

SUMMARY OF THE INVENTION

The present invention provides a projectile with a cavity which expands radially upon receiving compressed gas, thereby causing the outer surface of at least a portion of the projectile to engage in a sealing manner the inner diameter of the barrel of the launcher so as to increase the flight distance of the projectile.

The invention in one form is directed to a combat game weapon system including a pneumatic launcher and an elastic projectile. The pneumatic launcher includes a barrel, the barrel including a distal end and a bore with an inside diameter. The elastic projectile is configured for being expelled from the distal end of the barrel. The elastic projectile includes a cavity configured for expanding when the cavity receives a propellant from the pneumatic launcher and thereby for causing the elastic projectile to sealingly engage the inside diameter.

The invention in another form is directed to a combat game projectile for a combat game weapon system including a pneumatic launcher including a barrel having a distal end and a bore with an inside diameter. The combat game projectile includes an elastic projectile configured for being expelled from the distal end of the barrel of the pneumatic launcher. The elastic projectile includes a cavity configured for expanding when the cavity receives a propellant from the pneumatic launcher and thereby for causing the elastic projectile to sealingly engage the inside diameter.

The invention in yet another form is directed to a method of operating a combat game weapon system including the steps of: providing a pneumatic launcher including a barrel, the barrel having a distal end and a bore with an inside diameter; loading the pneumatic launcher with an elastic projectile including a cavity; receiving in the cavity a propellant from the pneumatic launcher; expanding the cavity, when the cavity receives the propellant from the pneumatic launcher, and thereby causing the elastic projectile to sealingly engage the inside diameter; and expelling the elastic projectile from the distal end of the barrel.

An advantage of the present invention is that it provides a simple foam rocket without rigid parts added thereto.

Another advantage is that it provides a simple foam rocket with an elastic cavity and main body.

Yet another advantage is that an outer surface of the main body can sealingly engage the inner diameter of the launcher when the elastic cavity receives a propellant (i.e., compressed gas) from the launcher.

Yet another advantage is that the foam rocket can fly a greater distance.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

FIG. **1** is an exploded, perspective view of an embodiment of the combat game weapon system of the present invention, the pneumatic launcher shown as a stand-alone device (not mounted under a paintball gun), the projectile exploded from the launcher;

FIG. **2** is a perspective view of the projectile shown in FIG. **1**;

FIG. **3** is a rear elevation view of the projectile of FIG. **2**;

FIG. **4** is a cross-sectional view of the projectile of FIG. **2** taken along line **4**-**4** in FIG. **3**;

FIG. **5** is a side elevation view of another embodiment of the combat game weapon system of the present invention, the projectile shown as being loaded into the muzzle end (the distal end) of the barrel of the launcher;

FIG. **6** is a side elevation view of the combat game weapon system of FIG. **5** with the barrel of the launcher and the projectile shown in cross-section as in FIG. **5**, the projectile shown at rest after having been loaded in the barrel of the launcher prior to injection of propellant;

FIG. **7** is a side elevation view of the combat game weapon system of FIG. **5** with the barrel of the launcher and the projectile shown in cross-section as in FIG. **5**, the cavity of the projectile shown as receiving propellant from the launcher and the closed end of the cavity shown as expanding due to receipt of propellant;

FIG. **8** is a side elevation view of the combat game weapon system of FIG. **5** with the barrel of the launcher and the projectile shown in cross-section as in FIG. **5**, the projectile shown as traveling toward the muzzle end of the barrel of the launcher after the cavity received propellant;

FIG. **9** is a fragmentary, cross-sectional view of the combat game weapon system of FIG. **5**, the barrel of the launcher and the projectile shown in cross-section as in FIG. **5**, the projectile not yet having received propellant from the launcher;

FIG. **10** is a fragmentary, cross-sectional view of the combat game weapon system of FIG. **5**, the barrel of the launcher and the projectile shown in cross-section as in FIG. **5**, the projectile having received propellant from the launcher;

FIG. **11** is a fragmentary, cross-sectional view of yet another embodiment of the combat game weapon system of the present invention;

FIG. **12** is a cross-sectional view of the combat game weapon system of FIG. **11**; and

FIG. **13** is fragmentary, cross-sectional view of yet another embodiment of the combat game weapon system of the present invention.

Corresponding reference characters indicate corresponding parts throughout the several views. The exemplifications set out herein illustrate embodiments of the invention, and such exemplifications are not to be construed as limiting the scope of the invention in any manner.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, and more particularly to FIGS. **1-4**, there is shown a first embodiment of a combat game weapon system **20** which generally includes a pneumatic launcher **22** and an elastic projectile **24**. Projectile **24** is loaded into launcher **22** and expelled therefrom upon squeezing a trigger **26**. Combat game weapon system **20** (as well as systems **120**, **220**, and **320**, below) has application to, but is not necessarily limited to, paintball games, although projectile **24** of system **20** may or may not itself carry a paintball to be exploded when projectile **24** strikes a target after having been launched by launcher **22**.

Launcher **22** includes trigger **26** and a barrel **28**. Barrel **28** includes a proximal end **30** (a breech end), a distal end **32** (a muzzle end), and a bore **33** having an inside diameter **34**. Inside diameter **34** is a structure which is the inside surface of barrel **28** along bore **33** (inside diameter can also correspond to a dimension as well when used in that sense). In an informal sense, launcher **22** can be thought of as a "grenade launcher." In FIG. **1**, launcher **22** is shown as a stand-alone device in that launcher **22** is not connected to the barrel of a gun. By way of an example, launcher can be a JCS JET CITY SPECIALTIES® paintball product, such as the MKX™ launcher by Blackpoint Engineering, LLC. Upon squeezing trigger **26**, launcher **22** emits a propellant **36** in order to push and expel projectile **24** from barrel **28**. Using propellant **36**, launcher **22** can, for example, launch a foam projectile **24** (i.e., a foam rocket) more than 100 yards (i.e., 150 yards) with a 120 mile per hour muzzle velocity (180 feet per second maximum muzzle velocity). Launcher **22** can use standard paintball air tanks or a 12 gram CO_2 (carbon dioxide) adapter. Launcher **22** is configured such that projectile **24** can be breech loaded, the breech being opened by pushing a button (projectile **24** in FIG. **1** is breech loaded in launcher **22**). Launcher **22** can have an aircraft aluminum construction.

FIGS. **5-10** show another embodiment of the combat game weapon system, having a reference number **120**. System **120** is identical to system **20** except that an alternative form of pneumatic launcher—launcher **122**—is used (thus, system **120** also uses projectile **24**). Launcher **122** is of an M203 style grenade launcher in which launcher **122** is mounted under the barrel of a gun. In this variant of the pneumatic launcher, projectile **24** is loaded into the muzzle end of launcher **122**. All reference numbers to launcher **122** are the same as those references to launcher **22**, except for reference number **122**. The principle of operation of the present invention remains the same whether launcher **22** or launcher **122** is used. FIGS. **5-10** show barrel **28** of launcher **122** and projectile **24** in cross-section taken along line **4-4** in FIG. **3** relative to projectile **24** and thus along the same line relative to barrel **28** when projectile **24** is loaded in barrel **28** (which corresponds to taking a section line through the top dead center position (or 12 o'clock position) of barrel **28** and the bottom dead center (or 6 o'clock position) of barrel **28**). FIGS. **9-13** show barrel **28** of the pneumatic launcher **122**. In FIGS. **5-13**, it is understood that launcher **22** could be used in place of launcher **122** to launch the projectile in accordance with the present invention.

Propellant **36** is a compressed gas. The compressed gas **36** can be a high pressure gas. More specifically, propellant **36** can be CO_2 or compressed air (otherwise referred to as high pressure air). Propellant **36** is shown in the drawings by virtue of its flow after having been injected into bore **33**, and thus propellant **36** is shown as arrows. Stated another way, reference character **36** in the drawings corresponds to both the propellant itself and to the flow direction of the propellant.

Regarding the projectile according to the present invention, one embodiment of the projectile is shown in FIGS. **1-10** as projectile **24**. Another embodiment of the projectile according to the present invention is shown in FIGS. **11** and **12** as projectile **124**. Yet another embodiment of the projectile according to the present invention is shown in FIG. **13** as projectile **224**.

Projectile **24** is elastic and is configured for being expelled from distal end **32** of barrel **28**. Projectile **24** is compressible and expandable and can rapidly substantially assume its initial shape following the end of an action of force. As such, projectile can be entirely elastic and thus may not include a rigid element. Projectile **24** has a foam body **37** and thus can be referred to as a foam projectile **24**. Projectile **24** can be such that it includes only foam body **37** (which can include a skin and define a cavity **50**, as described below), and thus projectile **24** is foam body **37**. Foam body **37** is made only of a soft, durable foam. Body **37** is a flexible, elastic, porous foam. Body **37** can be made out of a porous polymeric material, such as a polyurethane foam. For purposes of clarity, the drawings do not show any pores of foam body **37**. When forming foam body **37** in a mold, a skinning effect in the mold can be provided such that foam body **37** includes a skin. It is understood that the foam body **37** in FIGS. **1-10** includes the skin. The skin, while not specifically labeled in the drawings, is effectively shown by the solid lines forming the external contour of foam body **37** as well as the solid lines forming the contour of cavity **50**. The skin is thin, flexible, and elastic and forms a continuous and uninterrupted surface of foam body **37**, the surface being the external surface of body **37** and the surface of cavity **50** (cavity **50** being formed and thus defined by foam body **37**). The skin serves, at least in part, to enclose any otherwise exposed pores on the external surface of foam body **37** and on the surface of cavity **50** of foam body **37**. The skin of foam body **37** selectively has a predetermined thickness. The skin is made of the same material as foam body **37** and can thus made of a polymeric material, such as polyurethane. Projectile **24** can thus be a monolithic structure. Projectile **24** does not have a hard or rigid pin or tube therein (i.e., a plastic pin or tube).

An example of projectile **24** is the JCS JET CITY SPECIALTIES® F-69™ foam rocket by Blackpoint Engineering, LLC. Further, while FIGS. **1-4** show projectile **24** as having a solid nose (the nose being at leading end **40**), the nose could be hollow so as to form a hollow point projectile such that a

paintball could be loaded into the hollow nose and be carried by the projectile in order to explode when the projectile impacts a target. An example of such a hollow point projectile is the JCS JET CITY SPECIALTIES® F-69-HP™ foam rocket by Blackpoint Engineering, LLC.

Projectile **24** (and, thus, foam body **37**) further includes a longitudinal axis **38**, a leading end **40**, a trailing end **42**, a head portion **44** symmetric about longitudinal axis **38**, a fin portion **46** symmetric about longitudinal axis **38** and connected to head portion **44** in a seamless manner, an outer surface **48**, and a cavity **50**. While not specifically labeled in the drawings, a neck portion of projectile forms the bridge or transition between head portion **44** and fin portion **46**. When projectile **24** is loaded in barrel **28**, barrel **28**, projectile **24**, and, more specifically, cavity **50** are symmetric, and thus coaxial, about longitudinal axis **38**.

Leading end **40** and trailing end **42** are opposite ends of projectile **24** and are stated in reference to a direction of travel or flight **52** of projectile **24**. That is, leading end **40** leads trailing end **42** during travel through barrel **28**, out of barrel **28**, and flight through the air until projectile **24** impacts a target (not shown). Projectile **24** can have a longitudinal length, for example, of six inches.

Head portion **44** includes leading end **40** (which includes the nose of projectile **24**), a portion of outer surface **48**, and a closed end **60** of cavity **50**. Further, head portion **44** has a generally elliptical cross-sectional shape along longitudinal axis **38**. Head portion **44** and fin portion **46** provide projectile **24** with a missile-like or torpedo-like appearance. Head **44** can have a two-inch diameter. The nose has a curved shape which allows projectile **24** to hit the target relatively softly, the shape of the nose distributing the impact over a relatively wider area using the relatively soft foam forming projectile **24**.

Fin portion **46** includes trailing end **42**. Further, fin portion **46** includes a stem **54** and a plurality of fins **56** projecting from stem **54**. FIGS. **2-3** show fin portion **46** including four fins **56** spaced equidistantly about the circumferential periphery of stem **54**. Two fins can be relatively straight, while two fins can be slightly angled (have an offset portion) so as to create a proper spin and thereby to ensure a precise flight path of projectile **24** upon launch. In FIG. **3**, the straight fins are shown at the 12 o'clock and 6 o'clock positions, and the angled fins are shown at the 3 o'clock and 9 o'clock positions. The outermost radial extent of fin portion **46** can be substantially the same as, or alternatively a little less than, the outermost radial extent of head portion **44**. By way of example, the outermost radial extent of fin portion **46** can be approximately two-inches. Fin portion **46** can include more or less than four fins.

Cavity **50** is configured for expanding when cavity **50** receives propellant **36** from pneumatic launcher **22** and thereby for causing elastic projectile **24** to sealingly engage inside diameter **34** of barrel **28**. Cavity **50** is formed out of head portion **44** and fin portion **46** (as well as any neck portion therebetween). Cavity **50** is formed by the elastic foam body **37** of both head and fin portions **44** and **46** and is thus elastic itself and expandable. Cavity **50** is a longitudinally extending blind bore **50** formed in projectile **24** and thus includes an open end **58** and a closed end **60**. Open end **58** of cavity **50** is formed in trailing end **42** of projectile **24**. Closed end **60** of cavity **50** is formed in the interior of main body portion **44**. Closed end **60** can terminate inside main body portion **44** approximately halfway, or a little more, running from the proximal end of head **44** to the distal end of head **44**, the proximal end of head **44** being closer to fin portion **46** than the distal end of head **44** (the distal end of head **44** is the leading end **40** of projectile **24**). Stated another way, closed end **60** can terminate inside head **44** at approximately the part of head **44** where outer surface **48** of head **44** is the widest (along an axis which is transverse to longitudinal axis **38**), or just a little forward (towards leading end **40**) of that widest part.

Cavity **50** is symmetric about longitudinal axis **38** of projectile **24**. That is, longitudinal axis **38** forms the center point of a cross-section of cavity **50** taken along an axis which is perpendicular to longitudinal axis **38**. Longitudinal bore **50** can have a circular cross-section and a constant diameter (as a cylinder) running from open end **58** to a rounded closed end **60** (the rounded closed end forming generally part of a sphere). Such a longitudinal bore is shown, for example, in FIG. **13**. Alternatively, and as indicated in FIGS. **3-10**, longitudinal bore **50** can have an increased diameter portion **62** which includes closed end **60** and which has a diameter that is larger than the diameter of the portion of longitudinal bore **50** formed in the fin portion **46** of projectile **24**. That is, as longitudinal bore **50** runs from open end **58** to closed end **60**, bore **50** can have a circular cross-section and a constant diameter (like a cylinder) until, for instance, bore **50** reaches a transition position. The transition position can begin at the proximal end of head portion **44** or, optionally, at a position which is a little forward (towards leading end **40**) of the proximal end of head portion **44**. When bore **50** reaches the transition position, the diameter of bore **50** can begin to increase gradually (like a cone) until bore **50** reaches closed end **60**, which generally forms part of a sphere. As such, all or substantially all of that portion of bore **50** in head portion **44** has a larger diameter than that portion of bore **50** in fin portion **46**. As with all portions of cavity **50**, increased diameter portion **62** and closed end **60** are elastic and expandable. The shading in FIGS. **2-4** and **9-10** show the contour of cavity **50**, but shading of cavity **50** (and cavity **250** in FIG. **13** as well) is omitted in the other figures for purposes of clarity; thus, for instance, while contour shading of cavity **50** is not shown in FIGS. **5-8**, it is understood that cavity **50** in FIGS. **5-8** has the same contour as cavity **50** in FIGS. **2-4** and **9-10**. Having an increased diameter portion **62** of cavity **50** can be advantageous in facilitating expansion of that portion of cavity **50** in head portion **44** when cavity **50** receives propellant **36** from launcher **22**. Further, having an increased diameter portion **62** of cavity **50** can be advantageous in facilitating expansion of closed end **60**, and generally that portion of cavity **50** in head portion **44**, more than any other portion of cavity **50** when cavity **50** receives propellant **36** from launcher **22**.

Closed end **60** of cavity **50** expands when cavity **50** receives propellant **36** from launcher **22**. Further, closed end **60** can expand more than any other portion of cavity **50** when cavity **50** receives propellant **36** from launcher **22**. Further, outer surface **48** of head portion **44** is pressed against inside diameter **34** of barrel **28** when closed end **60** expands for having received propellant **36** from launcher **22**. More specifically, closed end **60** presses radially outwardly towards outer surface **48** of head portion **44** and thereby causes outer surface **48** of head portion **44** to be pressed radially outwardly and to be constrained by inside diameter **34** of barrel **28** so as to inhibit propellant **36** from flowing between outer surface **48** of head portion **44** of foam projectile **24** and inside diameter **34** of barrel **28** when closed end **60** receives propellant **36** from launcher **22**.

Now, additionally referring to FIGS. **5-8**, the principle of operation of the present invention is illustrated (again, the same principle of operation applies to system **120** as to system **20**). For the sake of clarity, barrel **28** of launcher **122** and projectile **24** are shown in cross-section in FIGS. **5-8**. FIG. **5** illustrates the loading of projectile **24** into the muzzle end **32**

(the distal end **32**) of launcher **122**, arrow **64** indicating direction of loading. FIG. **6** illustrates projectile **24** being at rest just before the firing of launcher **122**. FIG. **7** illustrates an initial condition in the firing of launcher **122**, wherein an air blast **36** (high pressure air is assumed to be the propellant **36**, for example) is introduced proximate to the center of the rear of projectile **24**—that is, proximate to trailing end **42** of projectile **24**. This allows high pressure air **36** to enter into cavity **50** causing a portion of projectile **24**, particularly that portion of cavity **50** associated with increased diameter portion **62** (and thus closed end **60**), to expand radially outwardly, as indicated by direction of expansion arrows **66**. As closed end **60**, for instance, expands, outer surface **48** of head portion **44** expands radially outwardly as well so as to thereby enhance the sealing of projectile **24** against inside diameter **34** of barrel **28**. As indicated by FIG. **8**, projectile **24** then travels down barrel **28** (in direction of travel **52**) and leaves distal end **32** of barrel **28** at a velocity that is enhanced by the sealing of outer surface **48** (what can also be referred to as the outside diameter) of head **44** of projectile **24** against inside diameter **34** of barrel **28**. This enhances the velocity of projectile **24**, thereby increasing the range to more closely simulate an actual grenade launcher.

Now, additionally referring to FIGS. **9** and **10**, there is shown a cross-sectional view of foam projectile **24**. In FIG. **9**, projectile **24** is at rest in barrel **28** proximate to breech end **30** of barrel **28** and pointed toward muzzle end **32** of barrel **28**, launcher **122** not having yet introduced the air blast **36** into barrel **28**. As illustrated in FIG. **10**, the wide portion of head portion **44** expands against inside diameter **34** of barrel **28** (as illustrated with the vertically oriented arrows **68**) as closed end **60** expands (the expansion in FIG. **10** of closed end **60** being shown by the greater size of closed end **60** relative to closed end **60** in FIG. **9**). The arrows in cavity **50**, as well as the horizontally directed arrows outside of cavity **50**, in FIG. **10** illustrate the flow of propellant **36** (i.e., compressed gas). The arrows in FIG. **10** outside of cavity **50** are shown as including broken lines; the brokenness of the lines indicates that the flow of propellant **36** travels behind the two fins **56** shown in FIG. **10**, considering that the section is taken directly through the middle of the two fins **56** shown in FIG. **10**. Closed end **60** of cavity **50** takes on an alternate shape that presses outward, causing outer surface **48** of main body portion **44** of projectile **24** to be pressed outwardly and to be constrained by inside diameter **34** of barrel **28**. This advantageously prevents or greatly reduces flow of any propellant **36** (i.e., air) around head **44**. This construct additionally places proportionately a greater weight in the forward portion of projectile **24** (the leading portion), thereby enhancing the flight of projectile **24** once it leaves barrel **28**.

In use, then, projectile **24** is loaded in barrel **28** of launcher **122** (or launcher **22**). Baby powder can be used to facilitate loading of projectile **24** in bore **33**. Upon squeezing trigger **26** of launcher **122**, propellant **36** (a compressed gas) is injected into barrel **28**. Propellant **36** enters cavity **50** and causes closed end **60** (or, more broadly, increased diameter portion **62**) of cavity **50** to expand. This expansion occurs, at least primarily, in head portion **44** of projectile **24**. This expansion of cavity **50** in closed end **60** causes outer surface **48** of head **44** to expand radially and thereby to sealingly engage inside diameter **34** of barrel **28**. This sealing engagement inhibits, completely or at least substantially, propellant **36** from traveling past projectile **24** outside of cavity **50**. Thus, projectile **24** is expelled with greater velocity than without such a seal.

Now, additionally referring to FIGS. **11** and **12**, there is shown yet another embodiment of the combat game weapon system of the present invention, that system having the reference number **220**. System **220** employs launcher **122** but could employ launcher **22** in place of launcher **122**. The foam projectile, now labeled as **124**, is shown in bore **33** of barrel **28** of launcher **122**. FIG. **11** shows only barrel **28** of launcher **122** and projectile **124**. The cross-section line in FIGS. **11** and **12** are taken through the 12 o'clock and 6 o'clock positions of both barrel **28** and projectile **124**. Projectile **124** is a third embodiment of the projectile according to the present invention. Projectile **124** includes cavity **150**. In FIG. **11**, projectile **124** has not yet received propellant **36** from launcher **122**; stated another way, FIG. **11** shows projectile **124** before firing launcher **122**. FIG. **12** shows cavity **150** of projectile **124** having received propellant **36** from launcher **122**. FIG. **12** also shows the deformation of the rear end (the trailing end) of foam projectile **124** as propellant **36** (i.e., high pressure air) enters barrel **28** pressing rear portion **148** of projectile **124** against inside diameter **34** of barrel **28** as projectile **124** moves down barrel **28**.

Now, additionally referring to FIG. **13**, there is shown yet another embodiment of the combat game weapon system of the present invention, that system having the reference number **320**. System **320** employs launcher **122** but could employ launcher **22** in place of launcher **122**. The foam projectile, now labeled as **224**, is positioned partially inside of barrel **28** of launcher **122**. FIG. **13** shows only barrel **28** of launcher **122** and projectile **224**. The cross-section line in FIG. **13** is taken through the 12 o'clock and 6 o'clock positions of both barrel **28** and projectile **224**. Projectile **224** is a fourth embodiment of the projectile according to the present invention and is in the form of a rocket propelled grenade. Projectile **224** includes cavity **250**. Projectile **224** has the cross-section of a rocket propelled grenade ("RPG"), with a rear portion (the trailing portion) that works under the principle of operation as discussed above. FIG. **13** shows cavity **250** receiving propellant **36** from launcher **122**. Double-arrow **272** shows the direction of expansion of closed end **260** of cavity **250**, as well as the direction of expansion of outer surface **248** of projectile **224** in the vicinity of this expansion of closed end **260**. While cavity **250** is shown as having a constant diameter, it is understood that cavity **250** could include an increased diameter portion like cavity **50**.

The present invention further provides a method for operating a combat game weapon system **20**, the method including the steps of providing, loading, receiving, expanding, and expelling. The providing step provides pneumatic launcher **22** including barrel **28**, barrel **28** including distal end **32** and bore **33** with inside diameter **34**. The loading step loads pneumatic launcher **22** with elastic projectile **24** including cavity **50**. The receiving step receives in cavity **50** propellant **36** from pneumatic launcher **22**. The expanding step expands cavity **50**, when cavity **50** receives propellant **36** from pneumatic launcher **22**, and thereby causing elastic projectile **24** to sealingly engage inside diameter **34**. The expelling step expels elastic projectile **24** from distal end **32** of barrel **28**. Elastic projectile **24** can include leading end **40** and trailing end **42**, cavity **50** being a longitudinally extending blind bore **50** in elastic projectile **24** such that cavity **50** includes open end **58** and closed end **60**, open end **58** formed in trailing end **42**, elastic projectile **24** being a foam projectile **24**. The expanding step can include expanding closed end **60** when cavity **50** receives propellant **36** from launcher **22**. The expanding step can include expanding closed end **60** more than any other portion of cavity **50** when cavity **50** receives propellant **36** from launcher **22**. The method can further include the steps of pressing closed end **60** radially outwardly towards outer surface **48** of elastic projectile **24** and thereby causing outer surface **48** to be pressed radially outwardly and

to be constrained by inside diameter **34** so as to inhibit propellant **36** from flowing between outer surface **48** of elastic projectile **24** and inside diameter **34** when closed end **58** receives propellant **36** from launcher **22**. Elastic projectile **24** can include fin portion **46** and head portion **44**, fin portion **46** including a plurality of fins **56** and trailing end **42** of elastic projectile **24**, head portion **44** including leading end **40** of elastic projectile **24**, closed end **60** of cavity **50**, and outer surface **48**, the method further including the step of pressing outer surface **48** against inside diameter **34** when closed end **60** expands for having received propellant **36** from launcher **22**.

While this invention has been described with respect to at least one embodiment, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

What is claimed is:

1. A combat game weapon system, comprising:

a pneumatic launcher including a barrel, said barrel including a distal end and a bore with an inside diameter; and

an elastic projectile configured for being expelled from said distal end of said barrel, said elastic projectile consisting of a forward portion and a rear guidance portion, said forward portion and said rear guidance portion including a cavity that expands when said cavity receives a propellant from said pneumatic launcher and that thereby causes at least one of said forward portion and said rear guidance portion to sealingly engage said inside diameter, said elastic projectile being a monolithic structure.

2. The combat game weapon system of claim **1**, wherein said elastic projectile includes a leading end and a trailing end, said cavity being a longitudinally extending blind bore in said elastic projectile such that said cavity includes an open end and a closed end, said open end formed in said trailing end, said elastic projectile being a foam projectile.

3. The combat game weapon system of claim **2**, wherein said closed end is configured for expanding when said cavity receives said propellant from said launcher.

4. The combat game weapon system of claim **3**, wherein said closed end is configured for expanding more than any other portion of said cavity when said cavity receives said propellant from said launcher.

5. The combat game weapon system of claim **2**, wherein said elastic projectile has an outer surface, said closed end being configured for pressing radially outwardly towards said outer surface and thereby causing said outer surface to be pressed radially outwardly and to be constrained by said inside diameter so as to inhibit said propellant from flowing between said outer surface of said elastic projectile and said inside diameter when said closed end receives said propellant from said launcher.

6. The combat game weapon system of claim **2**, wherein said rear guidance portion includes a fin portion and said forward portion includes a head portion, said fin portion including a plurality of fins and said trailing end of said elastic projectile, said head portion including said leading end of said elastic projectile, said closed end of said cavity, and an outer surface, said outer surface configured for being pressed against said inside diameter when said closed end expands for having received said propellant from said launcher.

7. A combat game projectile for a combat game weapon system including a pneumatic launcher including a barrel having a distal end and a bore with an inside diameter, said combat game projectile comprising:

an elastic projectile configured for being expelled from the distal end of the barrel of the pneumatic launcher, said elastic projectile consisting of a forward portion and a rear guidance portion, said forward portion and said rear guidance portion including a cavity that expands when said cavity receives a propellant from the pneumatic launcher and that thereby causes at least one of said forward portion and said rear guidance portion to sealingly engage the inside diameter, said elastic projectile being a monolithic structure.

8. The combat game projectile of claim **7**, wherein said elastic projectile includes a leading end and a trailing end, said cavity being a longitudinally extending blind bore in said elastic projectile such that said cavity includes an open end and a closed end, said open end formed in said trailing end, said elastic projectile being a foam projectile.

9. The combat game projectile of claim **8**, wherein said closed end is configured for expanding when said cavity receives said propellant from the pneumatic launcher.

10. The combat game projectile of claim **9**, wherein said closed end is configured for expanding more than any other portion of said cavity when said cavity receives said propellant from the pneumatic launcher.

11. The combat game projectile of claim **8**, wherein said elastic projectile has an outer surface, said closed end being configured for pressing radially outwardly towards said outer surface and thereby causing said outer surface to be pressed radially outwardly and to be constrained by the inside diameter so as to inhibit said propellant from flowing between said outer surface of said elastic projectile and the inside diameter when said closed end receives said propellant from the pneumatic launcher.

12. The combat game projectile of claim **8**, wherein said rear guidance portion includes a fin portion and said forward portion includes a head portion, said fin portion including a plurality of fins and said trailing end of said elastic projectile, said head portion including said leading end of said elastic projectile, said closed end of said cavity, and an outer surface, said outer surface configured for being pressed against the inside diameter when said closed end expands for having received said propellant from the pneumatic launcher.

13. A method of operating a combat game weapon system, said method comprising the steps of:

providing a pneumatic launcher including a barrel, said barrel including a distal end and a bore with an inside diameter;

loading said pneumatic launcher with an elastic projectile, said elastic projectile consisting of a forward portion and a rear guidance portion, said forward portion and said rear guidance portion including a cavity, said elastic projectile being a monolithic structure;

receiving in said cavity a propellant from said pneumatic launcher;

expanding said cavity, when said cavity receives said propellant from said pneumatic launcher, and thereby causing at least one of said forward portion and said rear guidance portion to sealingly engage said inside diameter; and

expelling said elastic projectile from said distal end of said barrel.

14. The method of claim **13**, wherein said elastic projectile includes a leading end and a trailing end, said cavity being a longitudinally extending blind bore in said elastic projectile

such that said cavity includes an open end and a closed end, said open end formed in said trailing end, said elastic projectile being a foam projectile.

15. The method of claim **14**, wherein said expanding step includes expanding said closed end when said cavity receives said propellant from said launcher.

16. The method of claim **15**, wherein said expanding step includes expanding said closed end more than any other portion of said cavity when said cavity receives said propellant from said launcher.

17. The method of claim **14**, further comprising the steps of pressing said closed end radially outwardly towards an outer surface of said elastic projectile and thereby causing said outer surface to be pressed radially outwardly and to be constrained by said inside diameter so as to inhibit said propellant from flowing between said outer surface of said elastic projectile and said inside diameter when said closed end receives said propellant from said launcher.

18. The method of claim **14**, wherein said rear guidance portion includes a fin portion and said forward portion includes a head portion, said fin portion including a plurality of fins and said trailing end of said elastic projectile, said head portion including said leading end of said elastic projectile, said closed end of said cavity, and an outer surface, the method further comprising the step of pressing said outer surface against said inside diameter when said closed end expands for having received said propellant from said launcher.

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